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**Usability and Cognitive Testing of the Login Screen for the
American Community Survey in English and Spanish**

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Abstract

The American Community Survey Office (ACSO) is interested in redesigning the login screen of the online response instrument. Based on feedback from experts at the 2019 National Academics of Sciences annual meeting, an interdepartmental team of researchers created a new login screen design. We compared the current production design and the newly developed design to better understand the usability of the designs as well as to obtain cognitive feedback. We tested both the English version and the version translated into Spanish. Ten English-speaking and ten Spanish-speaking participants were recruited for the study. For each language, five saw the production design and five saw the new design. Approximately half saw the design on their desktop/laptop display and half saw the design on their smartphones.

Overall, the new login screen performed well. The metrics included efficiency (how long it took to log in), effectiveness (how accurately participants entered the User ID), preference (self-reported preference of login screen given a side-by-side comparison of both designs), and satisfaction (self-reported ease or difficulty of logging in). Participants in both languages were more efficient (took less time) with the new design. For the other metrics, results varied across the two languages. For English-language speakers, the new design was more effective than the production design, meaning participants were able to log in without assistance more often. This was not the case for the Spanish-language participants, where the production design performed slightly better than the new design. More English-language participants preferred the new design; however, for the Spanish-language participants, there was a slight preference for the production design. English-language participants were equally satisfied with both designs, while the Spanish-language participants were more satisfied with the production design.

Participants also provided cognitive feedback about their impressions of the login screen during specific probing questions as well as from spontaneous verbalized comments. This feedback is included in the body of the report. The team recommends moving forward with the new design, as it was most successful with English-speaking participants. However, we are recommending some design alterations to address concerns raised with the Spanish-speaking participants.

Keywords: ACS, login, usability, multi-lingual

Contents

INTRODUCTION

1. Purpose

During a meeting held at the National Academy of Sciences (NAS) in December 2019, the U.S. Census Bureau received feedback and suggestions from experts[1] on how to improve the online ACS login screen. The experts were concerned that logging in to the instrument may be too difficult, and they made the following recommendations: (1) improve the layout to read from left to right and top to bottom, (2) move the location of the legal language from the top of the screen to the bottom of the screen, and (3) update the image of the mailing address label, used to show ACS respondents where to find their ID on mailing materials, to match current production materials. Using this feedback, an interdepartmental team comprised of staff from the American Community Survey Office (ACSO), Decennial Statistical Studies Division (DSSD), and the Center for Behavioral Science Methods (CBSM) created a new login screen design. When creating the new design, the team also decided to (1) make the language toggle link to access the survey in Spanish more noticeable and (2) improve the error message, displayed when someone fails to enter their ID correctly, by mentioning that the User ID is case sensitive. After the new design was complete, we conducted user testing of the new login screen comparing it to the current production design, with both English-speakers and monolingual Spanish-speakers.

The objectives of the study were to (1) identify usability and cognitive problems that interfere with a participant's ability to log in to the ACS on both larger screens (e.g., laptop or desktop computer) and smaller screens (smartphones) and (2) learn what participants find most memorable from the ACS login screen. We tested the instrument in two languages, English and Spanish. Results and feedback from this user testing are contained in this report and will inform improvements to the design of the new ACS login screen.

2. Research Questions

This research was designed to answer the following questions:
1. Are participants able to log in without assistance?
2. How long does it take participants to log in using the re-designed login screen in comparison to the current production login screen?
3. Which login screen do participants prefer?
4. Are participants able to use the postcard to find their User ID?
5. Are participants able to use the image/instructions on the login screen to find the User ID on the mail piece and enter the correct User ID in the login text fields?
6. In which design is the language toggle more apparent?
7. How often do participants use the language toggle inadvertently or not use the language toggle when they need it?
8. Where do participants look when they visit the login screen?
9. Do participants know where to go if they have questions?

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[1] Experts at the NAS meeting included Jolene Smyth, University of Nebraska (a primary advocate for a new layout for the login screen), Judd Kessler, University of Pennsylvania, Beth Jarosz, Population Reference Bureau, Doug Williams, Westat, and James Wagner, University of Michigan.

METHODS

1. Participants

Twenty participants (10 English-speakers and 10 monolingual Spanish-speakers) from across the country participated in this study, conducted in June and July of 2021. Half of the participants in each language were recruited to participate using larger screens (e.g., laptop or desktop computer) and half were recruited to participate using smaller screens (smartphones). Detailed demographics of participants are presented in Table 1. Participants had not participated in previous testing of the ACS instrument and had at least one year's experience with using the internet for tasks other than email.

Table 1. Participant demographics

Gender (number of participants)	English-language speakers	Spanish-language speakers
Male	6	2
Female	4	8
Age		
Mean (SD)	43 (13.2)	45 (11.01)
Range	27-67	25-57
Education (number of participants)		
Less than high school diploma	0	1
Completed high school	1	4
Some college, no degree	2	0
Associate degree	0	2
Bachelor's degree	6	3
Post-graduate degree	1	0
Hispanic origin (number of participants)		
Yes	0	10
No	10	0
Race (number of participants)		
White	8	5
Black or African American	2	0
American Indian or Alaska Native	0	4
Some other race	0	1

Participants were recruited using a variety of methods including an email announcement sent to all Census Bureau staff asking employees to share the study advertisement with their contacts; Craigslist ads; electronic flyers posted on neighborhood listservs; and the Center for Behavioral Science Methods recruiting database, which contains lists of participants who have volunteered to participate in our studies. This was an "add-on" study, which means for the first 35-40 minutes the participants worked on another project, unrelated to the ACS login screen.

2. Login Screen Prototypes

As noted above, there were four basic designs tested in each language: the current production design (see Figure 1) and the redesigned version (see Figure 2), each with a laptop/desktop and a mobile design. The login screens were functioning in that the participant could enter in the User ID into the fields, but after the participant clicked on the "login" button, they did not go to the first question of the survey. Instead, for testing purposes, the next screen displayed a brief message that said, "Thank you. The test administrator will tell you what to do next." To simulate the task of attempting to login at their homes, test participants had the User ID on a postcard and were simply asked to log in to the survey.

To address concerns about the current production error message text that appears if a respondent mistypes the User ID, we created a second task to compare the two different wording and designs for the error message screen for both the laptop/desktop and smartphone versions. The production error message screen said, "Login failed. Please try again." (See Figure 3), and the redesigned version said, "Login failed. The User ID is case sensitive. Please try again." (See Figure 4). For testing purposes, the error message function for mistyped User IDs was disabled. Instead, participants were shown static screen shots of the message (as shown in Figure 3 and Figure 4) and simply asked what they would do if they had received this message as shown on the screen. They were not able to interact with the page in the way they had with the login task. See figures in Appendix A for larger versions of the English-language login screen, the Spanish-language login screens, and the error message screens in English and Spanish.
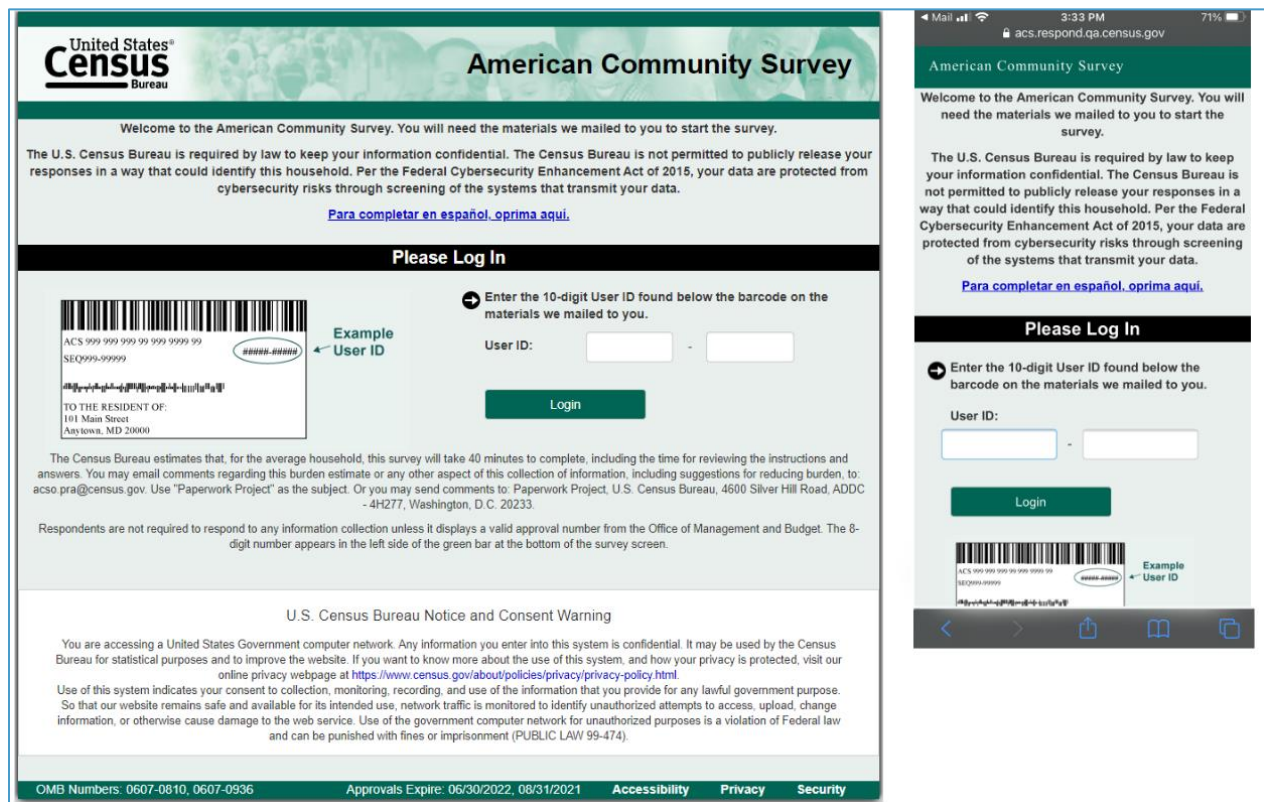
Figure 1. Screenshot of production design of ACS English login screen on laptop (left) and mobile (right)
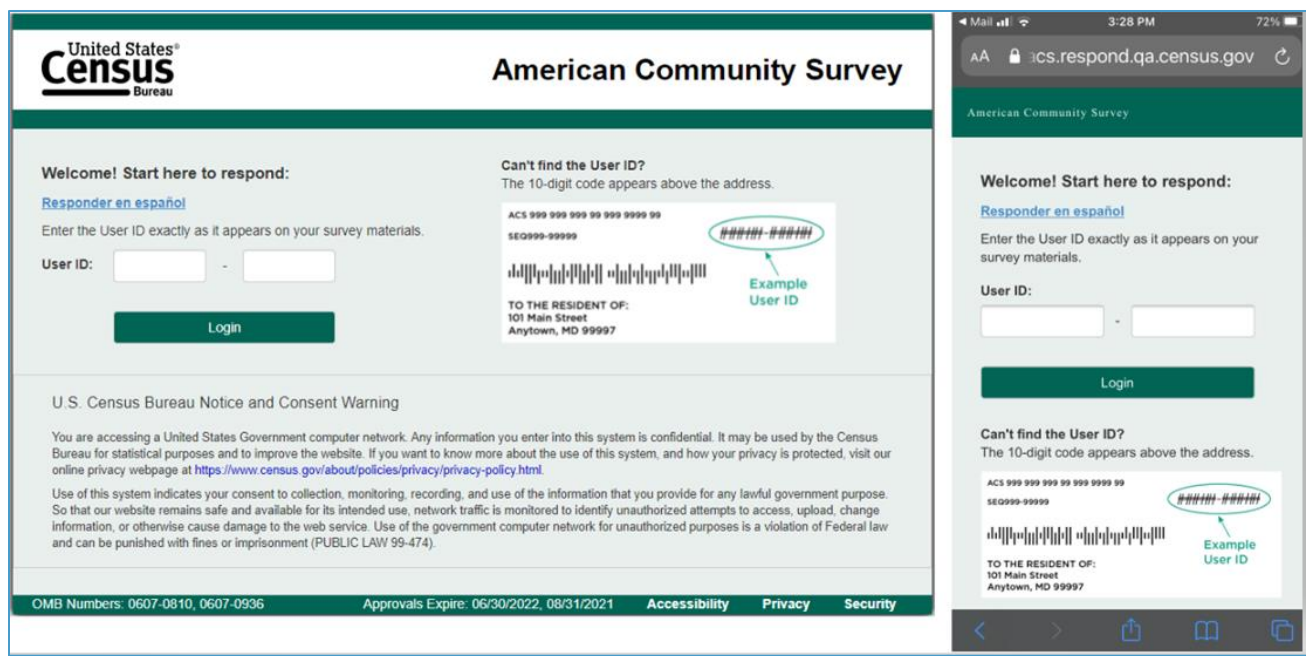
Figure 2. Screen shot of new design of ACS English login screen on laptop (left) and mobile (right)

Figure 3. Screen shot of production design of ACS English login error screen on laptop (left) and mobile (right)
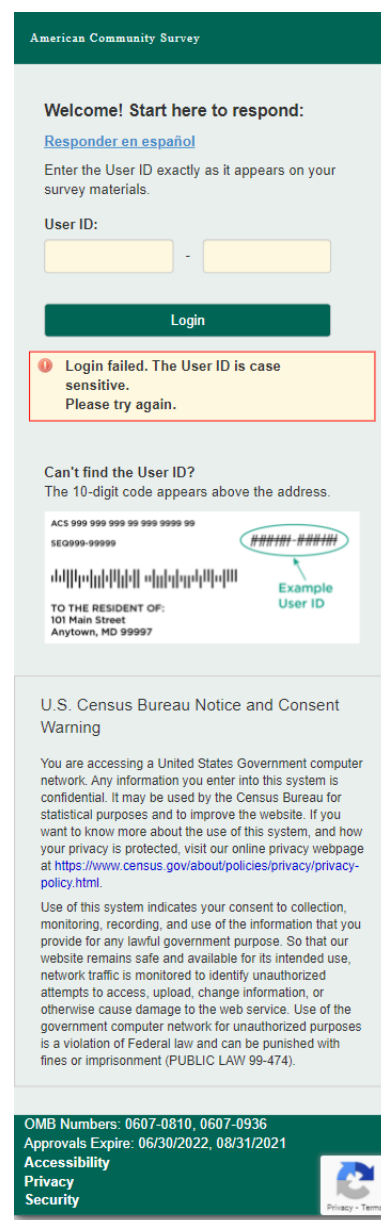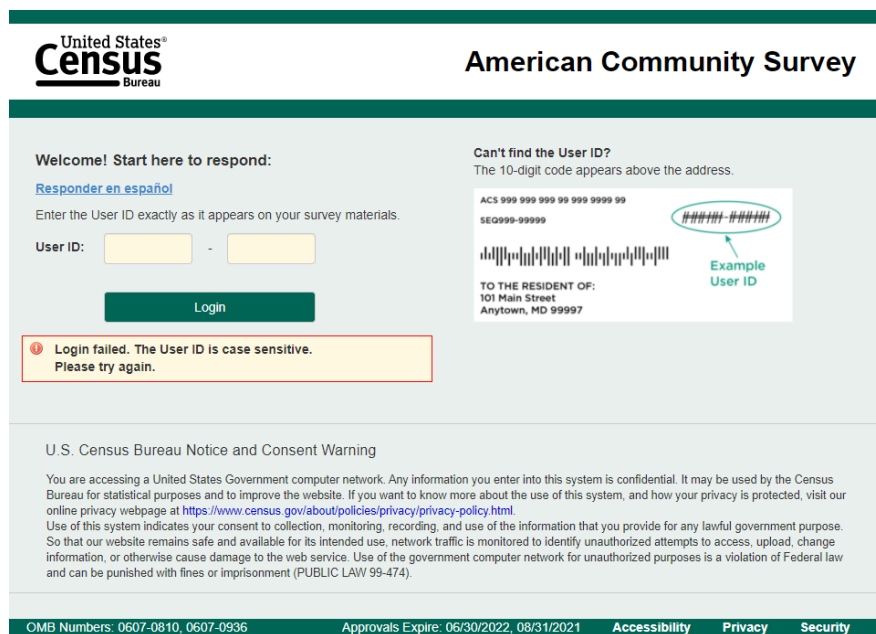
Figure 4. Screen shot of new design of ACS English login error screen on laptop (left) and mobile (right)

2. Mailing Materials with User ID

In production ACS, respondents are sent several mailings including letters and postcards. In the letters, the User ID is displayed prominently. The postcards also display the User ID but visually it is smaller and not as obvious as in the letters. Therefore, for testing purposes, we selected the more challenging of the mailing materials, which is the postcard used in production ACS fourth mailing[2] (see Figure 5).

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[2] While many ACS respondents typically do have the letter when they start to respond to the survey, we can imagine situations when a respondent may only have the postcard. For example, they could have lost the letter, never received the letter, or only happened to have the postcard in front of them when they started to respond.

Figure 5. Front and back of postcard

Due to COVID-19 related restrictions, all sessions were conducted remotely (e.g., participants in their home location and test administrators in their home location) using a standard screensharing software. Prior to the testing date, we mailed to the participants home address the ACS postcard inside of a U.S. Postal Service Priority Mailer[3]. Aside from the postcard including a fictitious address and User ID (which was the same on all postcards), the postcard was the same that is used in the current production cycle a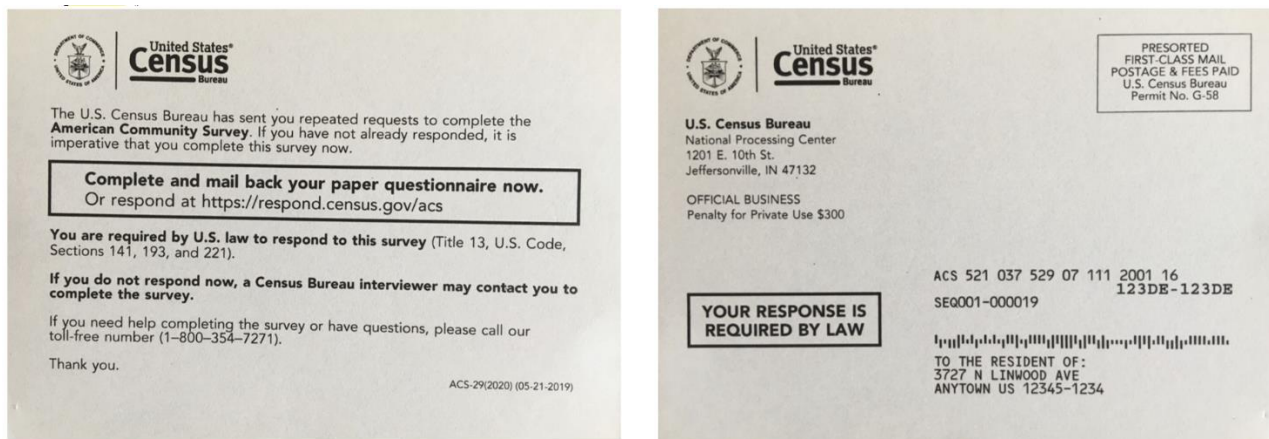s the fourth mailing. The postcard was entirely in English, as it is currently used in production.[4] The postcard has an alpha numeric all upper-case User ID. Although the User ID was in all upper case, as is standard practice for production, there is a risk that participants may not follow the User ID exactly as it appears on the post card and may enter the letters in upper or lower case. If a participant were to enter in a mix of upper and lower case letters or all lower case letters, they would not be able to login and would instead receive an error message. On the day of testing, participants were told to have the post card that they had been mailed as they would need it during the session.

Two of the ten English-language participants were away from home when they participated in the session, so we had to spontaneously email them the postcard. Five of the ten Spanish-language participants did not receive a physical postcard due to scheduling difficulties and instead had to receive the postcard via email. The postcard had the production URL. We asked participants to do whatever they would do at home upon receiving the postcard. The test administrator made a note of what URL the participant entered and from where (browser, google search, etc). After the participant finished typing in the production URL and before they clicked "go" or "enter" the test administrator interrupted and provided the test URL in the chat window. The participant was then asked to click on the test URL for the task to proceed.

3. Procedure/Protocol
As previously mentioned, this was an add-on study, which means the participants participated in another project that was unrelated to the ACS login screen for the first 35-40 minutes of their test session before working on the ACS login study for approximately 20 minutes. On average,

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[3] The postcards were production postcards with a fictious address. They were placed inside the priority mail envelope which had the participants' home address written on the envelope.

[4] In current ACS production, the postcard is in English unless the respondent contacts the Census Bureau and requests to receive materials in Spanish. This occurs infrequently. Consequently, we can assume that there are instances of Spanish-speaking households receiving the English-language postcard. This type of a scenario (e.g., Spanish speaking household receiving an English-language postcard) was what we wanted to test as we understand that such a challenging task does occur.

participants spent an hour working on the two different projects combined. We obtained a written consent to collect data from each participant, and each participant received a monetary incentive of $40 for participating in the studies. During the first part of the hour-long session, participants were trained by the test administrator (TA) in how to "think aloud" to provide us with spontaneous comments and to describe any cognitive difficulty they had with the interface or language/wording on the screen. The participants then completed the first study. When they started the add-on ACS portion of the study, the TA reminded them that they should continue to think aloud so that the team could learn about their thought process as they went through the tasks.

Participants then completed the study in the following sequence:
- Task 1—Log in to the ACS using either the production or the revised login screen.
- Satisfaction with Task 1—Participants answered a satisfaction question about Task 1. For satisfaction question wording, see Appendix C.
- Probes on Task 1—Participants answered a series of questions about the ACS login screen and their impressions about it. For the set of probes used, see Appendix D.
- Task 2—Participants were shown a static image of the "Login Failed" screen and asked what they would do if they landed on this page while filling out the survey.
- Satisfaction with Task 2—Participants answered a satisfaction question about Task 2.
- Preference—Participants were shown the alternate design of the ACS login screen they had not already seen and were also shown the ACS login screen design they had worked with in the first task again. They were asked which they preferred.
- Final comments—Participants were asked for final comments on the design of the login screen. See Appendix E for question wording.

As mentioned earlier these were remote testing sessions. To screen share, we used Microsoft (MS) Teams, the official approved screen sharing software at the Census Bureau. Participants used their own laptop/desktop or mobile device. he TA and observers were in a different location from the participant. Still, as with in-person usability testing sessions, all sessions were one-on-one, with one TA interacting with the participant. The team also had a note taker for each session. Observers were asked to save any questions until the end of the session and send their questions in MS Teams or over email to the TA, who then asked the participant the observers' questions.

4. Test Design
At the beginning of the study, the TA assigned each participant to use a specific device type. Approximately half of the participants answered with a computer and half answered on a smartphone. Participants were also assigned to work on the tasks with one screen design, either the new login and error message screens or the current production login and error message screens. It was only during the last portion of the study, when they were asked for their preference, that they saw both the new and the production designs together to provide comments on preference (see Table 2).

Table 2. Assignment to device and login screen design

	New ACS Login	Current Production ACS Login
English-language session on computer	3	2
English-language session on smartphone	2	3
Spanish-language session on computer	2	3

Spanish-language session on smartphone	3	2

5. Research Methodology

To measure the performance of the new login screen design, we studied its effectiveness and efficiency as compared to the production login screen. We also studied participants' self-reported satisfaction and design preference between the two designs. This section defines the metrics and shares the data analysis plan. For the quantitative data collected, we did not conduct statistical testing. We reviewed behavioral observations and spontaneous verbalizations to identify context for task performance problems.

Effectiveness: Accuracy data for Task 1 and Task 2. A "success" for Task 1 was if the participants entered in the User ID into the field exactly as it appeared on the postcard. A "success" for Task 2 was if the participant said they would re-enter the User ID using only uppercase letters. For data analysis on Task 1, we tallied which participants entered in the User ID exactly as it appeared on the postcard and without assistance from the TA. For those that did, we marked it as a success; for those that did not, we marked it as a failure. For Task 2, where the participant had to describe what they would do rather than showing us with their actions, we tallied which participants said they would re-enter the User ID again because of the letters in the User ID being case sensitive. Any participant that commented about doing it again while paying attention to case sensitivity was marked as accurate. Not mentioning case sensitivity was marked as a failure.

Efficiency: Timing data on Task 1. For data analysis of Task 1, we recorded the duration of time participants spent completing the task. The timing of Task 1 was started once the correct ACS login screen loaded, and the timer was stopped at the point where the participant clicked the "Login" button. For participants that failed to click on the "Login" button, we stopped the timer when the participant verbally indicated they were finished with the task.

*Preference***:** Participants' overall preference between the two login screen designs. For data analysis, we tallied participant preference for the login screen, new design versus the current production design.

*Satisfaction/Ease of Use***:** Participant's oral ratings of task ease or difficulty on a five-point scale (1 = very easy, 5 = very difficult; see Appendix C). The questions were asked at the completion of Task 1 and Task 2. For data analysis, we tallied satisfaction (ease of use) ratings based on participants' responses to the satisfaction questions.

Cognitive-behavioral feedback: Observation and verbal comments from participants collected in real-time during the tasks, satisfaction questions, probes, preference question, and debriefing questions. Comments for each case were summarized by researchers by reviewing video and audio of the session. We also reviewed any additional feedback provided by the participant during the debriefing section of the study and as they answered specific probes from the TA.

RESULTS

1. Are participants able to log in without assistance?

To answer this research question, we recorded and compared effectiveness across the two designs for Tasks 1 and 2 for participants in both languages.

English-language participants
In general, English-language participants were more successful at logging in and understanding the error message in the new design.

For Task 1, participants were asked to log in to the site. On the current production design, three out of five participants failed at logging in to the site. One participant on a mobile device never found the User ID and was unable to complete the task. This participant said he would call the 1-800 number if this happened to him outside the test situation. Two participants (one laptop and one mobile) entered the User ID with lowercase letters. On the new design, five out of five English-speaking participants were successful at correctly entering the User ID.

For Task 2, participants were shown the error screen and asked what they would do if they had received the screen when attempting to log into the survey. Four out of five participants on the current production site failed at knowing how to solve the error. One participant immediately looked at the screen and said, "It's case sensitive." However, the other four participants said they would try it again, verify it was not a typo, try a different number from the post card, or re-enter the same number again. These four participants did not mention anything about case sensitivity. For the new design, five out of five participants said they would change the case of the letters (from lowercase to uppercase). The new design has specific text in the error message about case sensitivity, and it appears that these five participants read that message and understood it, as they all mentioned entering the alpha numeric string again but paying attention to the case.

Spanish-language participants
In general, participants who completed the Spanish-language version of the study had fewer successful logins without assistance than those who completed the English-language version of the study. Some of these difficulties were linked to the text on the postcard being all in English.

For the current production design in Task 1, two out of five participants failed at logging in to the site without assistance. Both participants had to be prompted that they needed to go to a website to log in. They were not able to glean that information from the English postcard. One participant assumed the postcard would come with a paper survey to fill out and send in, and the other said she would wait for her husband to come home to help translate the postcard. On the new design, three out of five participants failed at logging in without assistance. All three of these participants had to be prompted that they needed to go to a website to log in. Issues included participants entering the incorrect number from the postcard and one participant who entered her name in the User ID boxes rather than the User ID number.

For Task 2, where participants told the TA what they would do if they had received the error screen, Spanish-language participants did not appear to identify the error more accurately in one design or the other. For the current production design, one participant mentioned that the User ID was case sensitive. The other four participants said that they would verify their User ID and try entering it again. Two of these participants said that if it did not work the second time, they would not try it again. For the new design, one participant mentioned that the User ID was case sensitive. The other four participants mentioned calling and asking for more information and verifying and reentering the User ID. One participant received an unintended computer error message in the test instrument that was not part of the task, but the participant assumed it was part of the task and focused only on that.

Takeaways
For English-speaking participants there were fewer issues with the new design than with the production design. For the Spanish-speaking participants, neither design seemed to perform better than the other. The issues that participants were encountering related more to the postcard being in English than the design of the login screen itself.

The new error message wording about case sensitivity appears to work for the English-speaking participants. For the Spanish-speaking participants, neither design seemed to perform better than the other.

2. **How long does it take participants to log in using the re-designed login screen in comparison to the current production login screen?**

To answer this research question, we calculated efficiency for Task 1 for participants in both languages.
Efficiency looked at how long it took participants to log in to the ACS login screen. Timing data was only collected on Task 1. Some of these times may have been affected by whether the participant had the physical postcard to look at while completing the task. Some participants had to receive the postcard in an email, which required them to navigate between windows for this process.

Timing data was not collected on Task 2, as that task only involved a participant telling the TA what they would do. They did not actually do the task, as the page was only a static image.

English-language participants
For the current production design participants, it took one minute and 45 seconds on average to log in. For the participants who saw the new design, it took 53 seconds on average to log in. See Table 3.

Table 3. English-language efficiency score by login design and device

	Laptop	Mobile	Average
Current production design	1:46	1:45	1:45
New design	0:33	1:23	0:53

Spanish-language participants
For the participants who saw the current production design, it took two minutes and 34 seconds on average to log in. Participants who saw the new design took two minutes and 13 seconds on average to log in. See Table 4. One participant was excluded because she immediately wrote her name in the User ID box and did not take the time to complete the task.

Table 4. Spanish-language efficiency score by login and device

	Laptop	Mobile	Average
Current production design	1:52	3:37	2:34
New design	1:18	2:31	2:13

Takeaways
For English-speaking participants, the average time needed to login was lower for the new design than for the current production design, suggesting that participants might log in faster with the new

design. For the Spanish-speaking participants, participants were slightly faster at logging in with the new design, but there was a lot of variation. Some of the slower times in Spanish may have been due to the postcard being in English. Other slower times for Spanish speakers may have been caused by participants needing to be emailed an electronic version of the postcard. The extra time may have come from needing to alternate between windows during the process. Five of the ten Spanish-speaking participants had to be emailed the postcard.

3. Which login screen do participants prefer?

Preference was a self-reported measure that a participant gave when looking at both the current production login screen design and the new login screen design. In this section, we also report measures of satisfaction/ease of use. Participants rated the login screen after Task 1 and after Task 2. They were asked how easy or difficult it was to know what to do on the screen. In translating their responses to numbers (1 to 5), lower numbers indicate greater ease of use, and thus more satisfaction among participants.

English-language participants

Two participants preferred the current production version of the login screen, six participants preferred the new design, and two participants preferred a mix or parts of both designs. Of the two who preferred a mix, one liked the top part of the old design (referring to the paragraph at the top that addresses confidentiality) and the bottom part of the new design. The other said he preferred parts of both and when asked why he said he liked the centered Spanish-language link of the old design because it stood out more. He then said he preferred the new design because the bar code was removed on the image and that matched the appearance of the postcard.

ForTask 1, the five participants who saw the current production design rated their satisfaction with the design a 2.2 on average, while the five participants who saw the new design rated their satisfaction with the design a 2.0 on average. For task 2, participants rated it a 1.4 on average for both the production design and the new design.

Spanish-language participants

Six participants preferred the current production design, while four participants preferred the new design. Participants who preferred the current production design liked the explanations about confidentiality, and they thought it was more serious and formal. Those who liked the new design mentioned that they liked that there was less to read and that it was to-the-point.

For Task 1, the five participants who saw the current production design rated their satisfaction with the design a 1.6 on average, while the five participants who saw the new design rated their satisfaction with the design as a 2.8 on average. For task 2, the five participants who saw the current production design rated it a 1.2 on average, while the five participants who saw the new design rated it a 2.2 on average.

Takeaways

More English-speaking participants preferred the new design. Still, we did get feedback on some parts of the old design that stood out as useful for some participants that could be incorporated into the new design. For the Spanish-speaking participants, there was a slight preference for the current production design.

For English-speaking participants, there was no real difference in satisfaction. In both conditions, participants were largely satisfied. For Spanish-language participants, there seemed to be stronger satisfaction with the current production design for both the login screen and the error message.

4. Are participants able to use the postcard to find their User ID?
Participants provided spontaneous feedback during the initial task while reviewing the postcard. This feedback can be useful for ACS in better understanding the pain points that participants may be experiencing when receiving the postcard and attempting to sign in with only that piece of the mailing materials.

English-language participants
One participant who had read the postcard and then went to the website said, "I don't recall seeing a User ID." After reading the postcard, another participant said her first thought was, "Where is the paper questionnaire?" Similarly, a participant said, "Is there a questionnaire attached to this?"

One participant said while looking at the postcard, "I assume this one code is the User ID, but I don't really know. It needs to be clear. It is not clear. I am going to try this number to see if this is what it is, but I really don't know." She continued, "The screen itself was easy. Me knowing what number to put in from the postcard was difficult. Because there are a lot of numbers on this postcard. And it doesn't make it clear I am supposed to use the numbers I used."

Participants who saw the production design with the graphic of a barcode and the postcard without the barcode commented on the absence of a barcode on the postcard, which was frustrating to participants. One participant succinctly put it, "I don't have a bar code. I don't know what I am supposed to put in."

Participants also provided spontaneous feedback on their struggles with finding the User ID. On the postcard, the User ID looked as it appears in Figure 6 (circled in orange to help readers of this paper identify the correct number). All login screens tested have a section on them where they show an image of where the User ID is in relation to the barcode/address label that appears on the postcard. The production and new design both have this image to aid the use find their User ID, but one appears on the right (production design) and one appears on the left (new design). The mobile screens also have this image slightly below the login field. In general, laptop participants did not struggle as much to find their User ID. Mobile participants had more of an issue, perhaps because the image is lower on the screen and not as noticeable. Across designs, participants had to work to locate the User ID on the postcard. Still, all but one English-speaking participant found and entered it.
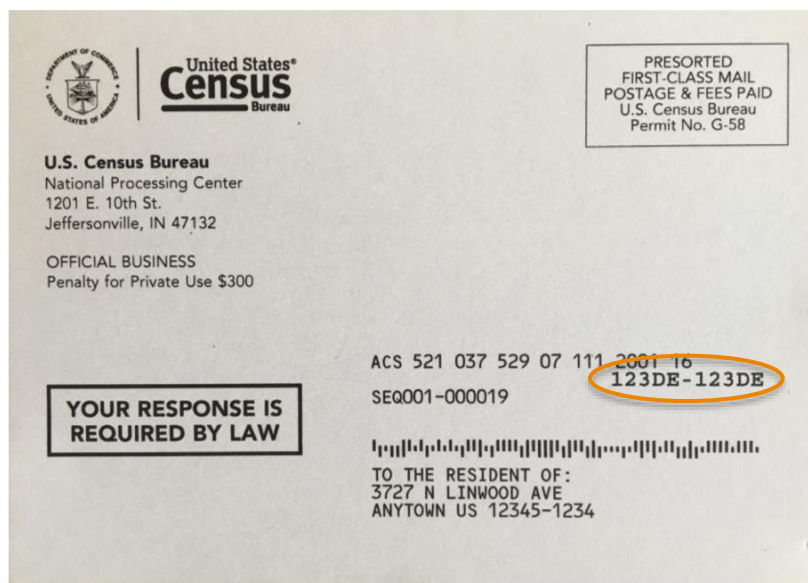
Figure 6. Screenshot of postcard with the User ID circled.

One participant who saw the production design on a smartphone asked if the code was the "SEQ" number, then saw the "123..." and said she thought that was a ZIP code. Then the participant started to count numbers to find a 10-digit code. This participant correctly selected the "123DE – 123DE" code because it was the right number of digits: "I'm just counting, counting all the numbers... that must be the number there.... it's 10." Similarly, another mobile participant commented, "I don't see a 10-digit number on the front of this. That's what it's showing me. I am having difficulty finding my 10-digit number at this point." A participant who worked with the production design during Task 1 on a laptop commented, "It's not clear if that number I typed in is my User ID."

One participant who worked with the new design during Task 1 on a smartphone commented that the website did not explicitly say to use the postcard to log in: "I was a little surprised that it didn't say 'use postcard'." However, this participant also said, "the visual display was clear on how to find the User ID." Another participant who started to type in the incorrect code eventually figured out that he had selected the incorrect code. He self-corrected, saying, "Okay I'm putting in the wrong code… that's why…"

Spanish-language participants

Some Spanish participants struggled to grasp what the postcard was asking them to do since the postcard was in English. One participant on mobile mentioned, "No entiendo eso que dice... pero puedo ver que es de los Estados Unidos, debe ser importante" (I don't understand what this says… but I can see that it is from the United States, it must be important). Another participant said, "Como a veces llega digamos un sobre como un formulario aparte lo que haría es llenarlo, responder las preguntas y enviarlo" (Like sometimes an envelope arrives with a separate form, what you would do is fill it out, respond to the questions, and send it). This participant had to be directed to the website to continue completing the tasks.

One participant on mobile at first indicated that she thought one could complete the survey by calling the number on the postcard. When asked what she would do if she received the postcard, she gasped and said, "Agarrar mi teléfono, el traductor de Google, y revisarlo por el traductor de Google" (Grab my phone, Google Translate, and go through it with Google Translate).

In general, Spanish speakers had a harder time finding the User ID than English-language speakers, since the postcard was in English. One participant who worked with the new mobile design during Task 1 did not use the postcard to find her User ID but was trying to find it in the example image on the website, which read SEQ999-99999. This participant entered 99999-99999 in the User ID. When the participant later found the correct ID, they said "¿No sería la que estaría precisamente arriba de la dirección como hace la indicación por el ejemplo?" (Wouldn't that be what was right above the address like it indicates in the example?).

Another participant who worked with the current production mobile design during Task 1said, "Comenzaría a ver cual de los números esos tiene 10, pero hay 2 que tienen 10. Pues no sé, tal vez probaría con uno y después el otro a ver si alguno funciona" (I would begin by looking to see which of the numbers has 10 (digits), but there are two that have 10. Well, I don't know, maybe I would try one and then the other to see if any of them work). One other participant, who worked with the current production laptop design during Task 1 said, "Y después me dan un ejemplo de la tarjeta, y pongo el... Sí, me está pidiendo identificar el número de usuario" (And then they are giving me an example of the postcard, and I put the... yes, they are asking me to identify the User ID).

Takeaways
Participants had difficulty finding their ID on the postcard without the image on the login page. This process was much more difficult for Spanish speakers, because the postcard was in English.

5. **Are participants able to use the image/instructions on the login screen to find the User ID on the mail piece and enter the correct User ID in the login text fields?**

To answer this research question, we observed participants' behavior and asked probing questions.

English-language participants
In general, across both designs, participants were able to use the image and instructions on the login screen to find the User ID. Most participants across both designs said that they had used the image on the website to find the User ID.

For the production design, four out of five mentioned using the image to locate the User ID on the postcard. One said, "That was the sole prompt." Only one out of five participants said that the image was not on his display. He was using his smartphone, and in the production design the image of the postcard is lower on the screen, requiring participants to scroll down. This participant did not realize it was there and was unable to log in.

In addition, two participants on the production design entered the User ID in lowercase letters, which would have triggered an error message on the real production site.

For participants working with the new design, all five mentioned using the image to locate the User ID on the postcard. One said, "Without it, [I] would have been lost. …would not have known what to put in." Another said, "It was very useful. Without it I might have typed in the SEQ code." Another said that they had used it but that they thought the postcard looked a bit different from the image online.

Participants did comment that the use of the dash and slight bolding of the User ID on the postcard was helpful in directing them to notice it. Team members have shared that a new font will soon be implemented in production that is easier to read and more bold than the font that is currently on the

postcard. These formatting changes aim to help the respondent identify the correct number to use as the User ID.

Spanish-language participants
In general, Spanish-language participants were able to use the image and instructions across both designs, though participants were more successful at logging in using the current production design. Participants in both designs said that they used the image to find their User ID.

On the current production design, four participants mentioned that they used the image to locate the User ID on the postcard. Three of the four participants noted that the image on the page did not match the postcard. This was because the type of barcode differed from the postcard to the image on the production login screen. The fifth participant did not see the example image on the login screen, because the screen was zoomed in too much. It was only after the task, during probing, where this participant was shown the example image. Even without the image, this participant was able to log in successfully by looking for a series of 10 digits on the postcard.

The feedback about the mismatch of the barcode to the image did not appear to affect participants' ability to log in, however, since all five participants on the current production design were able to log in successfully, although we note that some participants had to be directed to the webpage before they were able to start the login process.

For those participants who saw the new design, three said that they used the image to locate the User ID on the postcard. Two said they did not use the image, one of whom said, "Solo vi que está borrado y que dice la información de identificación de usuario." (I just saw that it was erased and that it says information about the User ID), presumably referring to the pound signs shown in the example image on the login screen where the number would appear.

Using the new design, two participants did not enter the User ID correctly, with one entering her name, and one entering the "SEQ" number. The number this participant entered was directly above the address on the example image and was not the ID that was above and to the right (see Figure 7).

Figure 7. Screenshot of Spanish-language new design with SEQ number circled in orange.

Takeaways

Most participants used the image to help them log in to the survey. The image of the User ID on the new design did seem to mimic more accurately what was displayed on the postcard. This seemed to be an overall improvement compared to the production image for the English-speaking sessions.

6. In which design is the Spanish-language toggle more apparent?

We asked participants if the survey was available in other languages. We note this study took place following another study regarding language spoken at home, and it is possible some of the participants' answers might have been influenced by this.

English-language participants

In the current production design, the Spanish-language toggle says, "Para completer en español, oprima aquí" (see Figure 8). The new design says, "Responder en español" and was a slightly lighter blue font (see Figure 9).

Figure 8. Current production ACS login screen with Spanish toggle link circled.

Figure 9. New ACS login screen with Spanish toggle link circled.

For the current production design, all five participants said the ACS was available in another language. Two of the five participants said they thought it was available in multiple languages. For the new design, one participant said it was not available in other languages and four said it was available in other languages. One of the four said she thought it was available in multiple languages.

In general, most participants across both designs indicated that the ACS is, or should be, available in other languages. What is unclear is if this was because these participants had actually seen the Spanish-language link or rather because they just assumed a government survey would/should be available in other languages. When asked about which languages it would be available in, participants mentioned Spanish, or that they expected to see it in a number of different languages.

Spanish-language participants
For Spanish-language testing, participants were given the postcard that had a link to the English-language login screen. On the current production design, three participants independently toggled the login screen to Spanish, while two did not. Those who did not completed the task with the page in English. They were later directed by the interviewer to toggle the page into Spanish.

For the new design, only one participant independently toggled the page to Spanish, while two did not. There were two additional participants (one mobile participant and one computer participant) whose browsers automatically translated webpages to Spanish, so they also did not click on the Spanish-language toggle as their screen was already appearing for them in the Spanish language. One of those participants did not seem to be aware that the browser was automatically translating pages. The translations provided through the browsers notably do not match the approved translation on the Spanish login screen, and any text that was part of an image was not translated.

Eight out of ten participants thought that the survey would be available in languages other than English and Spanish. Participants mentioned a variety of other languages. One participant said, "Pues, si es por ley la voy a tener que contestar en cualquier idioma, tendrán que buscar a alguien que lo traduzca" (Well, if it is required by law, I'm going to have to be able to answer in whatever language, they will have to find someone to translate it). Two participants thought the survey would not be available in other languages.

Takeaways
Participants generally understood that the survey was or should be offered in languages other than English, although these responses were not always tied to noticing the language toggle on the login screen. Fewer than half of the Spanish-speaking participants noticed the language toggle. The Spanish-language toggle hyperlink on the new design was a lighter blue than what is seen on the production design. This difference could potentially have been why participants did not notice the Spanish-language toggle link as readily as anticipated.

7. How often do participants use the language toggle inadvertently or not use the language toggle when they need it?
To answer this research question, we observed whether participants clicked the language toggle accidentally (English-language interviews) or failed to toggle to their preferred language (Spanish-language interviews).

English-language participants
None of the ten participants clicked on the Spanish-language link. This was not an issue observed during this study.

Spanish-language participants
All sessions were started on the English-language screen. As mentioned in the previous research question, on the current production design, three participants independently toggled the login screen to Spanish, while two did not. For the new design, only one participant independently toggled the page to Spanish, while four did not (two of which used a browser translator).

Takeaways
English-language participants did not accidentally click on the wrong language login link, but not all Spanish participants noticed the language toggle to navigate to the Spanish instrument.

8. Where do participants look when they visit the login screens?
All sessions were remote/virtual due to COVID-19, so we were not able to include an eye-tracking component in the study design. Instead, we used verbalizations of what participants said they looked at and paid attention to on the page. When they were not looking at the login screen, participants were asked to share everything they remembered about the screen. We used responses to this question and the spontaneous comments participants made as a proxy to better understand where participants may have looked and what participants read on the login screens.

English-language participants
For the current production design, participants mentioned things such as a number and being asked to log in:

- "Just to grab the postcard and log in. A 10-digit number… umm, I didn't read too much else into it."
- "Typing in the site and looking for the number on the card. My ID numbers to get into the site. At first I wasn't sure where they were because I didn't see a bar code and I looked further down and saw the ACS number and figured the 10 numbers were the ones in the darker number on my card."
- "It was a .gov website. It had black and white colors, [and] had a spot for User ID. Had an image of postcard. Image did not match the postcard. There were 2 boxes to input data."
- "Asking me to log in to start the survey. I remember the picture of the postcard, what it's supposed to look like. Where the numbers are located on the login. I remember the color of it – think it was green and black."

See Figure 10 for a word cloud from English-speaking participants about what they remembered about the login screen.
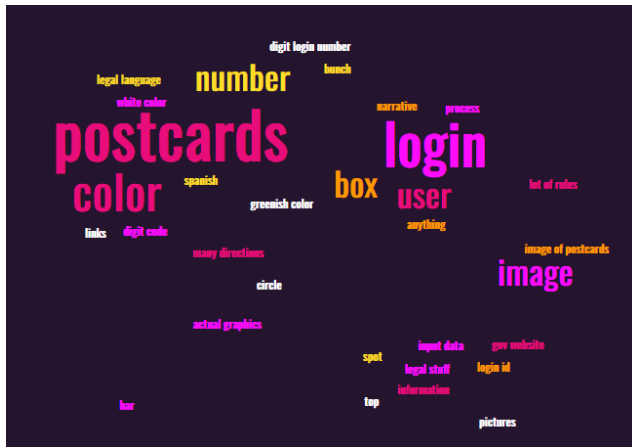
Figure 10. Screenshot of word cloud, production design: what English-speaking participants remembered about login screen

For the new design, participants mentioned remembering the login design for the ACS: being asked to enter the User ID in 2 boxes, being shown how to find the User ID, and that it was a login screen:

- It was a login for the ACS. Used codes above name to the right on the postcard. Saw there was "legal mumbo jumbo" but ignored it. Noticed it auto tabbed.
- "Asked me to enter User ID on left hand side. 2 boxes. Info on right to show me how to find the User ID. Believe Census logo was at top. And bottom fine print that I didn't read."
- It said what kind of survey it was. "It was asking for a 12-digit code. There were two different sections for the code."
- "It was a login screen; got there because of the postcard. Wasn't sure where to look on postcard for the User ID. Took a while for eyes to get to right to where login info was…. I successfully completed task in reasonable amount of time."

See Figure 11 for a word cloud from English-speaking participants about what they remembered about the login screen.

Figure 11. Screenshot of word cloud, new design: what English-speaking participants remembered about login screen

Spanish-language participants
Spanish-language participants seeing the current production design remembered:

- Where the User ID was on the reference image
- That there were lots of numbers

- The page was green and white
- There was a Census logo on the left side
- The example explained where to find the number
- The option for Spanish was in blue
- There were two little boxes to put in the numbers, and they were 5 and 5 digits

The Spanish-language participants seeing the new design remembered:
- It required a 10-digit number
- It was green
- There was an example on the right side
- The example said where to find the number
- "No recuerdo lo que escribí anterior porque me puse como un poco nervioso cuando me pedí el ID y no sabía cual de los dos era" (I don't remember what I wrote before because I was a little nervous when it asked for my ID and I didn't know which of the two it was). This participant was likely referring to the multiple series of numbers that appeared on the postcard.

Takeaways
Generally, participants did not read over all the details on the screen but rather remembered the most salient parts for the task at hand. They remembered that they were being asked to log in to the survey— that they needed a User ID, that the User ID was on the postcard, and that the survey had two fields to input the number.

9. Do participants know where to go if they have questions?
To answer the research question about whether participants knew where to go if they had questions, the team created a set of questions that we suspected some respondents may have when first coming to the ACS login screen. It is likely that most respondents throughout the United States do not have all these questions when they come to the online instrument to answer their ACS; nevertheless, we asked all participants these questions to get a sense of what respondents might do if they did have such questions.

Question 1: If you wanted to know how long it will take you to answer the survey, what would you do?

English-language participants
Most participants did not know the answer or responded that they may learn such information after logging in. This was true even for those on the production design which had the wording about it taking 40 minutes. See Figure 12 for where this fine print wording is displayed on the screen, circled in orange (for identification of the reader of this report.)

Figure 12. Current production ACS login screen with amount of time to complete (40 minutes) circled.

When working with the production design, two participants said there may be some kind of indicator once they click "Login." One participant said, when asked how long she thought it would take her to answer the survey, "telling people before you start is not the norm." Another participant mentioned if the survey is short the login screen could say that, but if it is long it could "discourage people" to provide that information. Two other participants did not initially notice the information on the screen, but then read the page more closely and saw the fine print that mentioned it would take 40 minutes on average. These participants only noticed it after they had been indirectly directed (in the form of probing questions about the screen) to read the text on the screen more closely.

When working with the new design, two participants mentioned they would do a Google search. Two participants said they did not know and one of them suggested, "I guess until you finish it." One other participant said that they would log in and hope for a "progress bar."

Spanish-language participants
Of the five Spanish-language participants who worked with the current production design, four of them noticed the text at the bottom of the page that said the survey would take 40 minutes. One participant did not notice this text and said that she would read the information on the postcard to find this information.

For the five Spanish-language participants who worked with the new design, two said that the time it would take to complete the survey would depend on the person responding, since everyone answers at a different pace. Two other participants mentioned that they would start the survey and then judge from there how long it would take. Finally, one participant said that she would "tal vez leer toda la información" (Perhaps read all the information).

Question 2:   If you wanted to know how the Census Bureau will protect your information when you answer the survey, what would you do?

English-language participants
On the production design, one participant said this was not something he would be worried about. One participant said there should be a disclaimer or a "pop up" that would tell you your information is protected. She said it should say something like, "This is a secure site and no one has access to your information." One participant said he often looks for features on the web page such as HTTPS, and a "lock icon" in the URL (see Figure 13).
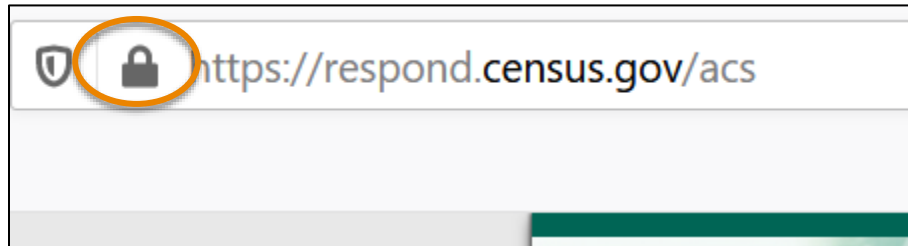
Figure 13. Participant described looking for the lock icon, circled in orange.

Two participants mentioned seeing the blue link to the privacy policy on the login screen (see Figure 14).
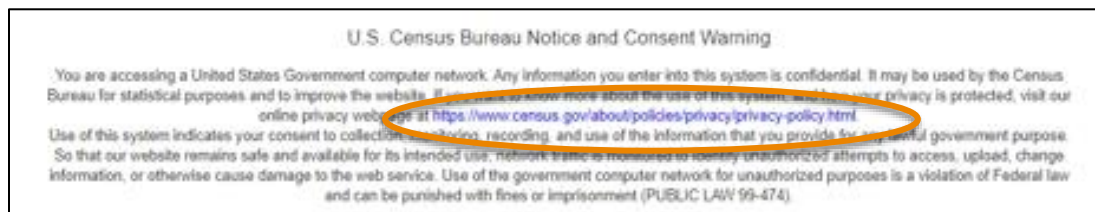
Figure 14. Two participants mentioned seeing this blue link to the privacy policy, circled in orange, production design.

On the new login screen design, one participant said they would look at the bottom of the screen, but that they did not know if it would be there. They did not actually look. Another participant looked at the postcard and said, "I don't see anything where I'm protected." Three participants mentioned they would click on the blue link to the privacy policy on the login screen (see Figure 15).
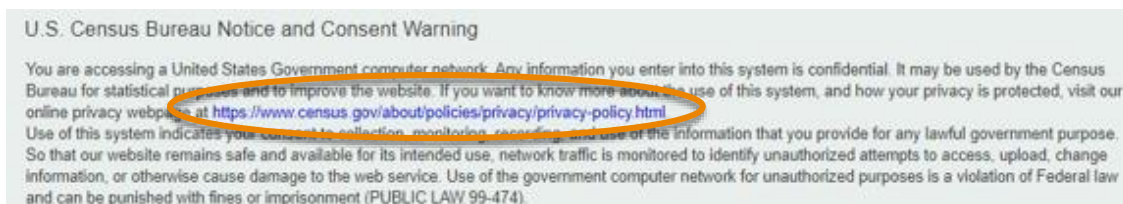
Figure 15. Three participants mentioned seeing the blue link to the privacy policy on new design.

Spanish-language participants
On the current production design, two Spanish-language participants specifically pointed out the blue link to the privacy policy at the bottom of the page. Another participant pointed out language at

the top of the page that says the Census Bureau is required to maintain confidentiality. One participant said he would read the notice at the bottom of the page, and another participant said that she trusted the Census Bureau because there was a signed agreement (presumably referring to the consent form they signed prior to participating in this study, but not referring to the ACS instrument).

On the new design, one participant specifically pointed out the blue link to the privacy policy at the bottom of the page, one participant mentioned reading the information at the bottom of the page, and one participant mentioned that she would call to find out this information. A participant said, "Yo creo que no hay ninguna manera de saberlo" (I believe there is no way to know this) while another participant said "¿Por intuición, confiar, no?" (Through intuition, trust, right?)

Question 3: If you wanted to know a little about the survey before answering it, what would you do?

English-language participants
Answers varied to this question for participants that worked with the production design during Task 1. One participant said that they did not know what they would do but would "probably just take the survey." Another said she would just take the survey but would stop if it asked for suspicious information like her Social Security number. One person mentioned that he would call the 1-800 number to speak directly with someone, and another participant said that she would do an internet search. She said she would use, "Lieutenant YouTube or Doctor Google." Finally, one participant said they would expect there to be some publicity about it, "like from the governor or TV ads." It is possible that this person was confusing the ACS with the decennial census or recalling some public service announcements about the Census Bureau.

In contrast, participants that interacted with the new design all mentioned specifically doing a Google search, searching the ACS website, or "searching it up."

Spanish-language participants
Of the Spanish-language participants using the production design, two participants said they would look for a phone number to call. Two other participants mentioned that they would use the link at the bottom of the page, seemingly referring to the blue link to the privacy policy. One participant said that she would ask the person who was interviewing them, indicating that she thought the survey was interviewer-administered.

For those who worked with the new design, one participant mentioned doing a Google search or searching the American Community Survey website. Another participant said they would call a phone number. One participant said they would ask for more information, while one said they would ask the person interviewing them. Finally, one participant said they did not know what they would do.

Question 4: Can you complete the survey without a User ID?

English-language participants
Seven out of eight[5] participants correctly thought it was not possible to complete the survey online without the User ID. One participant thought it was possible, but said she would only want to do it with her User ID.

Spanish-language participants
Ten out of ten Spanish-language participants correctly thought it was not possible to complete the survey online without using the User ID.

Question 5: Are you required by law to complete the survey?

English-language participants
Ten out of ten participants thought completing the ACS was required by law. Eight participants mentioned seeing the "REQUIRED BY LAW" language on the postcard. One participant said "probably" and the other participant said, "yes, because it is from the government."

Spanish-language participants
Eight out of ten Spanish-language participants thought that completing the ACS was required by law. One of these participants mentioned that "a veces puede sonar intimidante mencionar ley, mencionar gobierno, mencionar ese tipo de cosas" (sometimes it can sound intimidating to mention the law, to mention the government, to mention this type of thing). The same participant mentioned that he got the impression that Census-related things were generally optional, and that if this was mailed to someone, it should be voluntary. However, he realized that it was actually required by law. The only text referencing the response being required by law was in English on the postcard. This text does not appear on the login screen.

One participant said "tal vez" (perhaps) it was required by law, while another participant did not think it was required by law.

Takeaways
While the production site had some of the answers available on the login screen, many participants did not initially take the time to read over all the fine print on the page in detail. While some Spanish speakers mentioned that it was nice to have that information there, it was not clear that they would have read that information if they were not probed about it. The new design did not have all the answers on the login screen itself; however, participants' reports in how they said they would find the answers to the questions did not differ much between the two designs. Across both designs and in both languages, many participants said that they would turn to the internet to conduct searches to find the answers to the questions. There were also multiple Spanish-speaking participants who mentioned that they would try to gather more information by speaking to someone- either an interviewer or by searching for a phone number. Participants understood they needed to use a User ID to log in and most understood it was required by law. However, we note that text about the response being required by law did not appear in Spanish on the postcard.

Recommendations
The new design worked better for English-speaking participants with respect to effectiveness, efficiency, and satisfaction, and more English-speaking participants preferred the new design. For Spanish-speaking participants, the new design did not perform better than the current production

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[5] Two of the ten participants were not asked this question by the TA, which was an oversight by the TA.

design. There was a slight preference for the current production design among Spanish speakers, and there was a higher rate of success in the current production design of logging in without assistance. However, Spanish speakers were overall faster at logging in using the new design. We recommend moving forward with the new design, but with minor edits to improve functionality as described below.

The new design error message has specific language about case sensitivity. This appears to work better than the current production design for English-language speakers, although it did not seem to perform differently than the current production design in Spanish. We recommend implementing this new error message for the login screen.

We also make recommendations for updates to the ACS mailing materials.

Updates to the new design
The blue hyperlink to switch languages on the new design was not as noticeable as the team imagined it would be. One modification we recommend implementing in the new design is to make the blue link more consistent with the darker blue color of the other link on the page, as this color is potentially more noticeable. We also recommend putting the blue language toggle link in bold font.

The text mentioning where to find the User ID on the postcard could be made more specific. Rather than saying that the code appears above the address, we recommend saying that the code appears above and to the right of the address.

Finally, because Spanish speakers who preferred the production design mentioned liking the information about confidentiality, we recommended adding in the language of how the Census Bureau protects respondents' confidentiality. To see a mockup with the recommendations implemented on the new design see Figure 16.

Figure 16. Screenshot of new design with updated recommendations implemented.

We also recommend further research to see if it would be helpful to include a link to the FAQ from the login screen. This could address some of the questions respondents may have, but it could also distract them from the task at hand, which is to log in to and get started on the survey. It may be preferable to keep the FAQs link location as it is currently designed which is to have it appear after respondents have logged in. Topics that we recommend considering in an FAQ (if they are not already there) include:

- Information on how the Census Bureau protects data: A few participants mentioned that this information was important to them
- Length of survey: The small fine print of the current production design does not seem to stand out in any way as the place for the answer to this question. However, as the length is somewhat long, this could suppress response if it was called out or emphasized too much.

Updates to the mailing materials
For Spanish speakers, one major obstacle was the fact that the postcard they received was entirely in English. For monolingual Spanish speakers, the task of logging in is made considerably harder by this. We recommend adding text to the postcard in Spanish that would direct respondents to the Spanish version of the login screen. This would also address the issue of Spanish-language speakers having trouble finding the language toggle once on the login screen.

It is important to note that the new production materials are undergoing some changes Two of the first three mailings will have instructions for completing the ACS online in Spanish. Similar to

current practice, a Spanish Help Line is provided where Spanish materials can be requested or it can be completed over the phone.

Next steps
The team has discussed adding a few additional questions about the ACS login screen to an upcoming research project that is part of a larger Census Bureau effort to learn how best to design online screens so that they can be standardized across all surveys at the Census Bureau. That study will use the Qualtrics platform and an online non-probability panel. Participants will be able to provide feedback on two variant ACS login screen designs: the current production design and the new design with the updated recommendations (as seen in Figure 16). However, in the Qualtrics platform, participants will not be able to interact with the two screens, so the data collected will be solely qualitative feedback about their impressions of the screen. Results will be shared with the team and documented in a future report.

APPENDICES

Appendix A. Screenshots of designs used in usability testing sessions

Figure 17. Screenshot of English-language laptop/desktop login screens for ACS production design (left) and new login design (right).
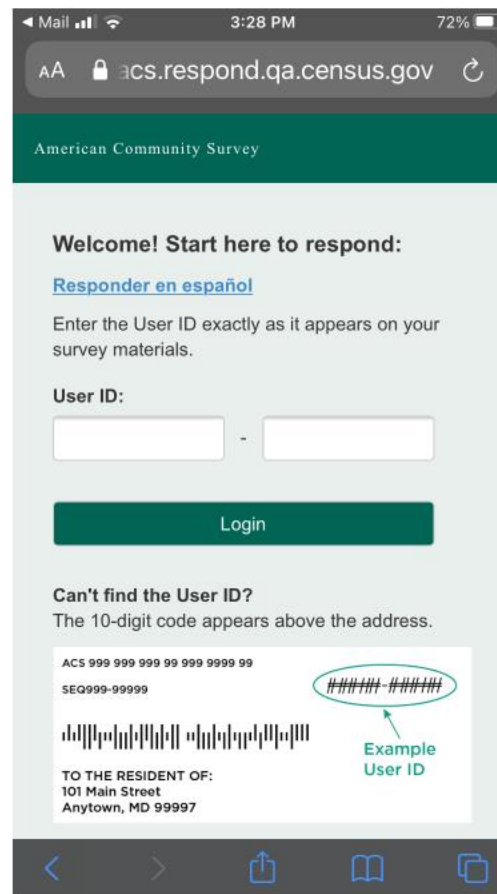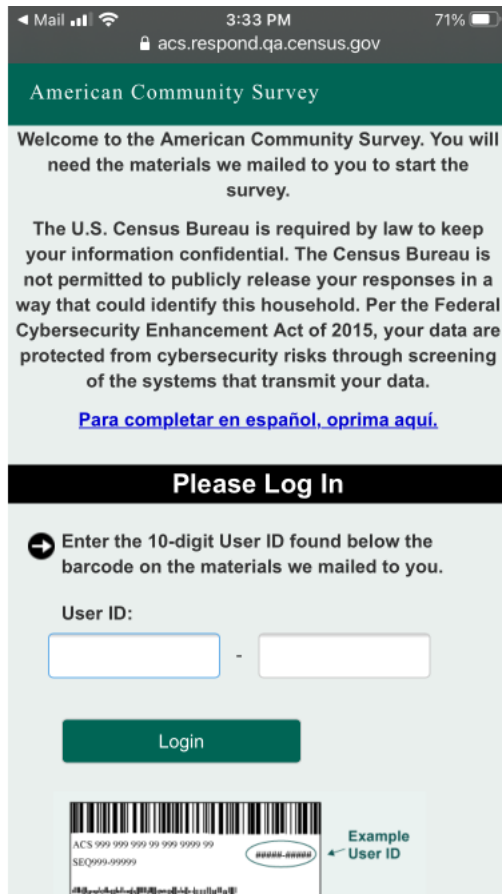
Figure 18. Screenshot of ACS English-language login screens mobile version of current production (left) and new design (right)

Figure 19. Screenshot of ACS English-language laptop/desktop error message screen, production (left) and new design (right)
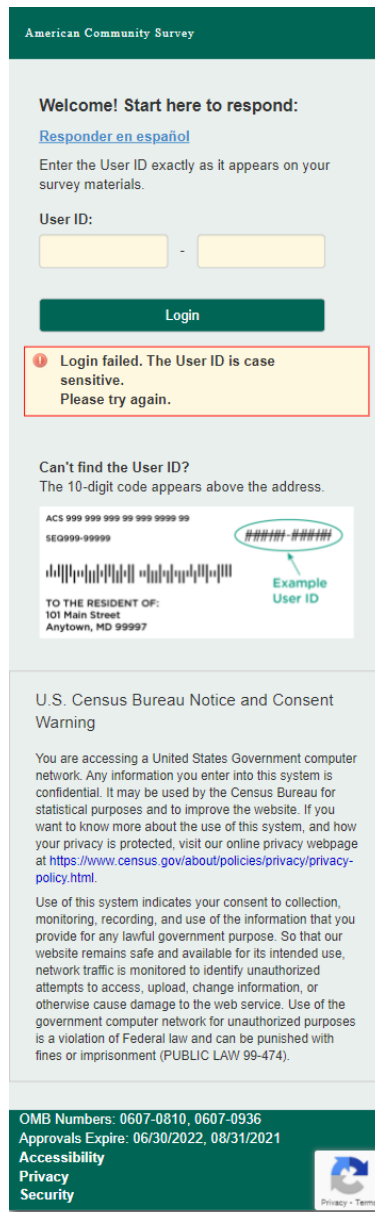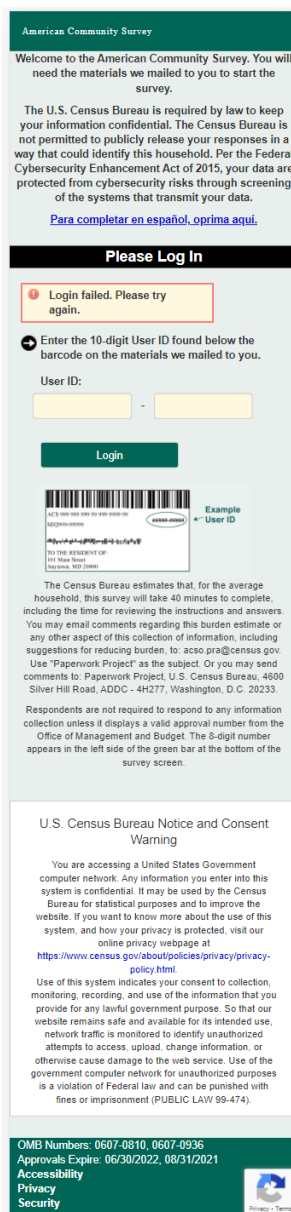
Figure 20. Screenshot of ACS English-language mobile error message screen, production (left) and new design (right)

Figure 21. Screenshot of Spanish-language laptop/desktop login screens for ACS production design (left) and new login design (right).
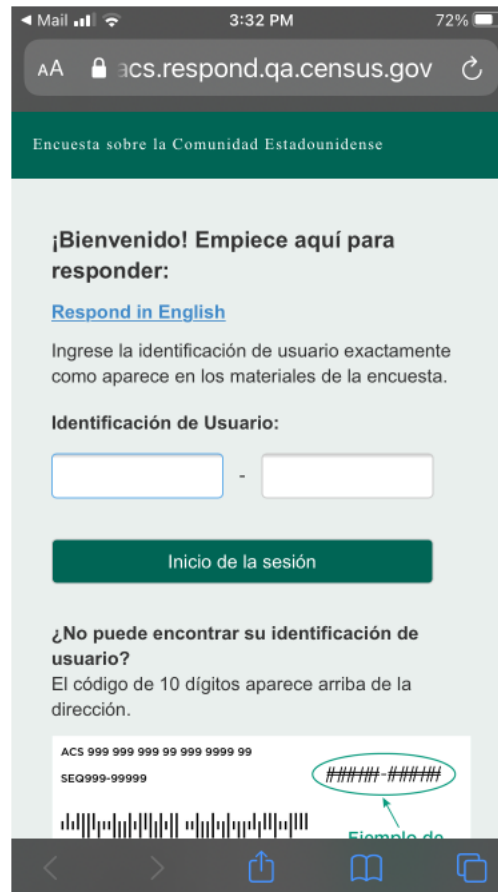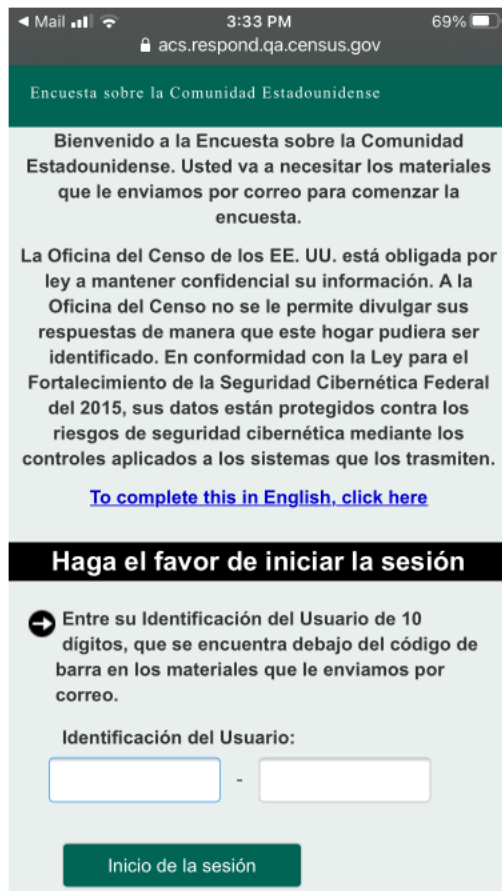
Figure 22. Screenshot of ACS Spanish-language login screens mobile version of current production (left) and new design (right)

Figure 23. Screenshot of ACS Spanish-language laptop/desktop error message screen, production (left) and new design (right)

Figure 24. Screenshot of ACS Spanish-language mobile error message screen, production (left) and new design (right)

Appendix B. Postcard

Front of postcard:

Back of postcard:

Appendix C. Satisfaction Question

Orally asked of participant directly after Task 1 and Task 2:
How easy or difficult was it to know what to do on the screen? Was it:
Very easy
Somewhat easy
Neither easy nor difficult
Somewhat difficult, or
Very difficult?

Appendix D. Probes

Probes for Task 1 (English)[6]

1. What do you remember about the screen you just were working with? Tell me everything you remember.
2. Where did you find your User ID?
3. How easy or difficult was it to find the User ID?
4. Do you think you could complete the survey without your User ID?
5. Do you think you are required by law to complete the survey?
6. Do you think the survey is available in languages other than English? (If yes, what language(s)?)
7. What would you do if you wanted to answer the survey in Spanish?
8. If you wanted to know how long it was going to take you to answer the survey, what would you do?
9. If you wanted to know how the Census Bureau will protect your information when you answer the survey, what would you do?
10. If you wanted to know a little bit about the survey before answering it, what would you do?
11. Did you use the image circled in red on the screen to help you find the ID?

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[6] Probes were nearly identical in Spanish. The languages referred to in probes 6 and 7 were switched.

Appendix E. Final Debriefing Questions

1. Do you have any additional thoughts on the screens we looked at today that you would like to share [*show screen from Task 1 and then show screen from Task 2*]?
2. Were there any other parts of getting started or logging in to survey screen that were confusing or difficult?
3. Is there anything else you'd like to mention that we haven't talked about?
4. [Any observer questions]